4.0 CONSERVATION PROGRAM

Section 4.0 of this HCP describes the Conservation Program that has been developed to avoid and minimize the potential adverse effects of the Covered Activities on the Covered Species, and the mitigation measures that will fully mitigate for the unavoidable take of Covered Species. The goal of this Conservation Program is to minimize the potential adverse effects of the Covered Activities described in Section 3, and to enhance the overall quality of habitat at Stanford for the Covered Species. The implementation of this Conservation Program will provide an overall benefit to the Covered Species, despite the ongoing and future Covered Activities. This section also implements Stanford's Biological Goals and Objectives, which are described in Section 1.5.2.

All Stanford lands have been divided into management zones, based on their intrinsic value to the Covered Species. Additionally, the potential habitat areas for the Covered Species have been divided into two geographical areas: the Matadero/Deer Creek Basin, and the California Tiger Salamander Basin. Stanford will establish two corresponding Preserved Areas to preserve large areas of biologically sensitive habitat within each of the Basins. The HCP also describes the Monitoring and Management Plans that will be implemented for each of the Preserved Areas, as well as minimization measures that will be used to reduce impacts (Figure 4-1).

4.1 CREATION OF MANAGEMENT ZONES

The HCP classifies Stanford's lands into four management zones according to the habitat value of the land, if any, to the Covered Species. The four zones and the quality of habitat they provide are discussed below. Figure 4-2 depicts the location of these zones. [1]

Zone 1: Areas classified as Zone 1 support one or more of the Covered Species or provide critical resources for a Covered Species. These areas are necessary for the local persistence of the Covered Species. A few areas that are currently degraded by the presence of a temporary land use also are included in Zone 1 if they are located in a place deemed critical for the long-term persistence of a Covered Species. If managed, or in some places enhanced, Zone 1 areas could support higher densities of the Covered Species. Development in Zone 1 will be avoided to the maximum extent feasible. Some areas in Zone 1 will be subject to extensive restoration and enhancement. There are approximately 623 acres in Zone 1.

Zone 2: Zone 2 areas are occasionally occupied by a Covered Species and provide some of the resources used by the Covered Species. These areas generally do not support individuals of the Covered Species on a year-round basis, but they provide indirect support to the Covered Species by providing a buffer between Zone 1 areas and areas that are impacted by urban and other uses. Zone 2 does not include any breeding habitat for the Covered Species. Under this Conservation Program, most of these areas will be maintained in a manner that will preserve their habitat values, and some portions of Zone 2 may be enhanced to more directly support Covered Species.

[1] All of the spatial data presented in this document was projected into Stateplane Coordinate System, California Zone III, NAD 83, using Geographic Information Systems (GIS). Acreage calculations appearing in this HCP may be different than previously published data due to differences in the methods used to determine acreages. The HCP covers all Stanford University owned lands, including the SLAC National Accelerator Laboratory (SLAC) and land around SLAC that is subject to a federal lease for the facility.

When feasible, land in Zone 2 will not be developed. There are approximately 517 acres in Zone 2.

Zone 3: The lands in Zone 3 are generally undeveloped open space lands that have some biological value, but provide only limited and indirect benefit to the Covered Species. Under the Conservation Program, these areas will be operated and developed in a manner that does not adversely affect the Covered Species, but these lands are generally more desirable areas for future development than Zones 1 or 2. There are approximately 688 acres of land in Zone 3.

Zone 4: Zone 4 includes land that does not support or cannot sustain the Covered Species. This Zone includes urbanized areas that have been developed by the University or its ground lessees and those areas that are completely surrounded by urban development and/or roads, or are otherwise isolated from areas that support a Covered Species. Also designated as Zone 4 are generally small, but highly developed facilities such as the radio telescope, which are located within areas that otherwise support Covered Species. Zone 4 areas are population sinks for the Covered Species. The Conservation Program includes measures to reduce the likelihood that a Covered Species would enter Zone 4, and if an individual is found in Zone 4, it will be relocated to a more environmentally sound location by an authorized biologist. The further development of Zone 4 areas would not adversely affect any of the Covered Species. There are approximately 2544 acres of land in Zone 4.

4.2 MEASURES TO MINIMIZE THE POTENTIALLY ADVERSE EFFECTS OF THE COVERED ACTIVITIES

Some of the University's structures and uses, particularly utility infrastructure and academic activities, are located in areas that support the Covered Species. These infrastructure systems will have to be maintained and improved during the life of the HCP. Likewise, the University engages in a number of ongoing activities that could affect the Covered Species. To avoid or minimize the impacts on Covered Species from these activities, Stanford will implement the following measures. **Unless specified otherwise, the Minimization Measures described below apply *only* to the Covered Activities when they occur in *Zones 1 and 2*.**

The HCP requires Stanford to undertake a wide range of conservation measures that will minimize the potential adverse effects on the Covered Species of operating the University. In a few instances, Stanford cannot predict at this time whether a particular conservation measure is necessary, or if a particular measure can be feasibly implemented. Therefore, in a few instances, the HCP requires Stanford, through the Conservation Program Manager, to determine the feasibility of undertaking certain conservation measures. For the purposes of this HCP, the terms "feasibility" or "when feasible" when discussing goals, objectives, and conservation measures, are defined as follows: The Conservation Program Manager's feasibility determination shall be made after taking into consideration, and balancing appropriately, existing technology, cost, and logistics in light of the overall purposes and goals of the HCP and the specific activity at issue. The Conservation Program Manager's responsibilities and role in implementing the HCP are described more fully in Section 6.3.2 of the HCP.

4.2.1 Lagunita Reservoir

To avoid and minimize the impacts from maintenance and operation of Lagunita, Stanford will implement the following measures.

Lagunita Reservoir Measures

- Routine maintenance of the Lagunita drain or berm will be conducted when Lagunita is dry, in consultation with the Conservation Program Manager.

- A California tiger salamander education program will be developed by the Conservation Program Manager and presented annually to Lagunita maintenance workers. The education program will include restrictions on animal control programs and protocols for salamander identification, avoidance, immediate protection, and notification of the Conservation Program Manager. The Conservation Program Manager will have the authority to stop work if a Covered Species is encountered and may relocate the individual to a safer location within Zones 1 or 2.

4.2.2 Creek Maintenance Activities

To avoid and minimize the effects from creek maintenance activities, Stanford will implement the following measures.

General Creek Protection Measures

- Whenever feasible, maintenance, repair, or construction of in-stream structures will be performed without the use of coffer dams or heavy equipment and will be conducted in the dry season.

- Heavy equipment will only be operated on a dry creekbed. If feasible, heavy equipment will remain at the top of the creek bank or on a side bench. In the event that heavy equipment is required for in-stream activities, the Conservation Program Manager will conduct a visual survey along the transportation route to determine the least environmentally damaging route to the creek.

- When heavy equipment or coffer dams will be used, the Conservation Program Manager will be consulted and may assign measures that reduce the impact of the work on the Covered Species.

- When in-stream activities are required, the amount of creek channel and bank impacted will be limited to the smallest area required to safely and efficiently complete the work.

- Upon completion of the work, any newly exposed surfaces will be stabilized with the appropriate ground cover (clean gravel if part of the creek channel is disturbed, geotextiles and plantings if a bank has been disturbed).

- An education program will be developed by the Conservation Program Manager and presented annually to maintenance workers. The education program will include

discussion of the potential for red-legged frogs and garter snakes to be present near the in-stream facilities and actions that will encourage animals to disperse from the area prior to work.

- Erosion and pollution control measures will be implemented.

Creek Maintenance Measures

- Future creek bank stabilization efforts will be conducted only if a bank failure is a risk to public safety, roads and other structures, or is detrimental to red-legged frogs. Areas of active bank collapse will be evaluated to determine the extent of the impact and if remedial actions are warranted. The Conservation Program Manager will determine the need, extent, and type of bank stabilization structure applied. The bank stabilization proposals will be submitted to the Service.

- When bank stabilization efforts are required, Stanford will use bioengineered structures. Rip-rap, rock, and other hardscape materials will only be used where required (e.g., areas of high scour).

- When feasible, bank failures may be addressed by grading and setting back creek bank and/or the extension or creation of flood benches consistent with the channel geometry to increase habitat diversity and increase the size of the creekside riparian zone. These more spatially invasive methods of creek bank stabilization (i.e., larger creek cutbacks) will be implemented if they are compatible with existing and future adjacent land uses and other natural resources.

- Woody debris in the creek channel and adjacent riparian zones is generally beneficial and will be left in place, unless it poses a flood or erosion hazard. Except in an emergency, the Conservation Program Manager will be consulted if removal of woody debris becomes necessary. Removal will be conducted by hand unless circumstances require the use of machinery. Appropriate erosion and pollution control measures will be in effect during these removals.

4.2.3 Academic Activities

Research, teaching, and field studies are central to the University's existence. To avoid and minimize the impacts from current and future academic activities, Stanford will implement the following measures.

Academic Activities Measures

- Unless academic resources are located within sensitive biological areas (e.g., archaeological sites), academic activities that could adversely affect the Covered Species will be conducted in areas that do not contain sensitive resources.

- Open pits, trenches, and excavated areas shall be secured at the end of the daily excavation, in a manner that prevents Covered Species from entering them. The site will be secured with a solid barrier (e.g., silt fence, plywood, etc.) a minimum of 3 feet tall at

the perimeter of the site, buried at least 4 inches into the ground. If the solid barrier coincides with a cyclone fence, the solid barrier will be attached to the outside of the cyclone fence. The barrier will be inspected by an appropriately trained person once a week, and repairs/replacement will be made as necessary. Smaller pits also shall be covered. If Covered Species are found within the excavation, the Conservation Program Manager will be contacted. The Conservation Program Manager will have the authority to stop work if a Covered Species is encountered and may relocate the individual to a safer location within Zones 1 or 2.

- If the academic resources to be studied are located in Zones 1 or 2, the Conservation Program Manager will review those activities that could adversely affect the Covered Species through ground disturbance, biological sampling, biological exclosures, clearing vegetation, and/or creek channel or pond disturbance.[2] If necessary, use conditions may be imposed by the Conservation Program Manager. All disturbed sites will be restored in a manner approved by the Conservation Program Manager.

- An academic site disturbance lasting longer than 1 year will be considered a permanent loss of habitat for the purposes of the HCP and will be mitigated in accordance with Section 4.4 of the HCP.

4.2.4 Utility Installation and Maintenance

To accommodate the people and facilities at Stanford, the University campus has been developed with a significant amount of urban infrastructure. To avoid and minimize the impacts from utility installation and maintenance, Stanford will implement the following measures. In addition, Utility Installation and Maintenance activities will be subject to the *General Infrastructure Measures* and *General Creek Protection Measures*.

Existing Utility Measures

- Underground utilities maintenance activities will be limited to the existing utility corridors to the extent feasible. However, if it is infeasible to use an existing corridor due to changes in land uses, new technology, or because of safety concerns, new utility corridors may be constructed in accordance with the *New Utility Measures*.

- The Conservation Program Manager will be notified before any utility line maintenance or replacement occurs within Zones 1 and 2.

- An on-site biological monitor will be present during all ground-disturbing activity in Zones 1 and 2. The biological monitor will have the authority to stop work if a Covered Species is encountered and may relocate the individual to a safer location within Zones 1 or 2.

[2] The Conservation Program Manager does not have to be consulted before undertaking academic activities that are not likely to affect the Covered Species, such as walking around Lagunita, swimming/boating in Lagunita, walking on existing trails or roads, water sampling from the creeks/Lagunita, photography, counting plants, crossing the creeks, and walking off of trails/roads during the dry season.

- Heavy equipment will be used only if it is not feasible to excavate, clear vegetation, and expose the utilities by hand.

- After service, underground utility lines must be reburied as soon as possible, the original topsoil spread across the construction site, and the disturbed area seeded with native plant species.

- Erosion control devices must be implemented during underground utility maintenance activities that occur between October 15 and March 15.

- Any native trees or native shrubs that are removed will be replaced, but not necessarily in the same location.

- The disturbance to areas around existing above-ground utilities will be kept to a minimum.

- If feasible, and beneficial to the Covered Species, existing above-ground utilities will be placed underground, excluding storm drainage that may be conveyed in open ditches.

- The modification of any enclosed reservoir tank will be limited to the existing footprint of the structure to the extent feasible. Enclosed reservoir tanks may be expanded beyond the existing footprint or moved if it is not feasible to remain within the existing footprint. If it is not feasible to remain within the existing footprint, the Conservation Program Manager will be consulted and may assign measures that reduce the impact to Covered Species. Such measures may include restoration of temporarily disturbed areas. The expansion of an enclosed reservoir tank will be considered a loss of habitat requiring mitigation.[3]

- Utility trenching will be scheduled during the dry season. If utility trenching is required during the wet season (October 15-March 15), the Conservation Program Manager will be consulted and may assign measures that reduce or avoid the likelihood that the trenching areas will be a barrier and/or pitfall trap during species movement. Utility trenching in the streambed of creeks will be limited to the dry season and comply with the *General Creek Protection Measures*.

- A California tiger salamander education program will be developed by the Conservation Program Manager and presented annually to maintenance workers before any trenching or other underground maintenance work is done in Zones 1 or 2 of the California Tiger Salamander Basin. The education program will include protocols for identification, avoidance, immediate protection, and notification of the Conservation Program Manager.

New Utility Measures

- The Conservation Program Manager will be consulted before new utilities are installed.

[3] Lagunita is an open water reservoir and is addressed by the *Lagunita Reservoir Measures*.

- New utilities will be sited in existing utility corridors or existing road alignments. New utilities may be sited in new utility corridors only if it is not feasible to place new utilities in an existing corridor or roadway because, for example, an existing corridor or roadway is not available, or due to changes in land uses, technology, or safety concerns. New utility corridors also may be constructed irrespective of the feasibility of using an existing corridor or roadway if the Conservation Program Manager determines the new corridor will have fewer impacts on the Covered Species than the use of an existing corridor or roadway.

- An on-site biological monitor will be present during all ground-disturbing activity in Zones 1 and 2. The biological monitor will have the authority to stop work if a Covered Species is encountered and may relocate the individual to a safer location within Zones 1 or 2.

- Any areas that are disturbed by the installation of new utilities will be restored in accordance with recommendations made by the Conservation Program Manager.

- Open pits, trenches, and excavated areas will be backfilled as soon as possible, and will be secured at the end of every work day in a manner that prevents Covered Species from entering them.

- The construction site will be secured with a solid barrier (e.g., silt fence, plywood, etc.) a minimum of 3 feet tall at the perimeter of the site, buried at least 4 inches into the ground. If the solid barrier coincides with a cyclone fence, the solid barrier will be attached to the outside of the cyclone fence. The barrier will be inspected by an appropriately trained person once a week, and repairs/replacement will be made as necessary.

- If a Covered Species is found during construction in Zones 3 and 4, the Conservation Program Manager or another biologist qualified by the Service will relocate the Covered Species to more suitable habitat in Zone 1 or 2.

- If new utility corridors are permanently cleared of vegetation (e.g., if vegetation is cleared and not replanted or allowed to naturally re-grow), it will be considered a permanent loss of habitat and mitigated in accordance with Section 4.4. Mitigation for the loss of habitat may be required for more than just the footprint of the cleared vegetation.

- Installation of new utilities within the streambed of creeks will be limited to the dry season and comply with the *General Creek Protection Measures*.

- Any area that is disturbed by new utility-related construction activities for longer than 1 year will be mitigated as a permanent loss of habitat in accordance with Section 4.4 of the HCP.

4.2.5 General Infrastructure

To accommodate the people and facilities at Stanford, the University campus has been developed with a significant amount of urban infrastructure. To avoid and minimize the impacts from

current and future infrastructure, Stanford will implement the following measures. In addition, General Infrastructure activities will be subject to the *General Creek Protection Measures*.

General Infrastructure Measures

- Any new or existing general infrastructure activity within Zones 1 or 2 that is not covered by a specific measure will be reviewed by the Conservation Program Manager. The Conservation Program Manager will recommend specific measures that are consistent with the HCP to reduce or eliminate the potential adverse effects on the Covered Species. These measures may include, but are not limited to, seasonal limitations on maintenance activities, revegetation, and input on the location of new facilities.

- An education program will be developed by the Conservation Program Manager and presented annually to maintenance workers who regularly work in Zones 1 or 2 and contractor personnel before they begin work in Zones 1 or 2. The education program will address tiger salamanders, red-legged frogs, and garter snakes and will include protocols for identification, avoidance, immediate protection, and notification of the Conservation Program Manager. The Conservation Program Manager will have the authority to stop work if a Covered Species is encountered and may relocate the individual to a safer location within Zones 1 or 2.

- All activities associated with the operation, maintenance, and installation of infrastructure improvements will be conducted in an environmentally responsible manner in accordance with practices outlined in current industry published manuals, such as FishNet4C (2007), Flosi et al. (1998), Lovett and Price (2007), and Pacific Watershed Associates (1994).

Paved Private Road Measures

- New paved roads within Zones 1, 2, and 3 will be considered a loss of habitat requiring mitigation, and will be sited only after input from the Conservation Program Manager. In general, no new paved road will be built in Zone 1 unless the increase in paved surfaces would benefit the Covered Species or if a new road is required for safety reasons.

- Road realignments in Zones 1 and 2 that benefit the Covered Species (e.g., moving an existing road further from a riparian zone and restoring the existing road) are considered an enhancement as described in Section 4.3. Realignments required to address safety concerns or for other reasons will require mitigation unless the Conservation Program Manager determines the new road alignment, with restoration of the old road, would serve as habitat enhancement.

- Maintenance activities on existing paved private roads will remain within the existing road footprint and will be performed consistent with industry standards for the conservation of resources.

- Vehicular access on paved private roads will be restricted to authorized personnel.

- These roads will be monitored periodically by Stanford for structural integrity, erosion, and to assess whether they are a potential barrier to wildlife dispersal.

- Proposed streetlights, drains, or curbs will be reviewed by the Conservation Program Manager, and if they would adversely affect the Covered Species, they may be approved only if they are required for safety reasons.

- Paved private roads will be "storm-proofed" to minimize runoff of sediments and contaminants from roads to riparian areas and creeks using principals, procedures, and prescriptions described in FishNet4C (2007) or then current guidance.

- Maintenance of paved private roads and shoulders will be conducted using principals, procedures, and prescriptions described in FishNet4C (2007) or then current guidance.

Unpaved Service Road Measures

- New unpaved roads within Zones 1, 2, and 3 will be considered a loss of habitat requiring mitigation, and will be sited only after input from the Conservation Program Manager. In general, no new unpaved road will be built in Zone 1, unless the increase in unpaved surface would benefit the Covered Species or if the new unpaved road is required for safety reasons.

- Re-surfacing with gravel or compacted dirt will be the preferred repair treatment. Any other materials must be approved by the Conservation Program Manager prior to use.

- Access on unpaved service roads will be restricted to authorized personnel.

- No streetlights or curbs will be constructed on unpaved service roads.

- Service roads will be monitored by Stanford at the end of the rainy season for structural integrity, erosion, and to assess whether they are a potential barrier to wildlife dispersal.

- Changes to road alignments and any new roads will be reviewed by the Conservation Program Manager and designed to meet appropriate conservation standards (e.g., Flosi et al. 1998, Pacific Watershed Associates 1994).

- Unpaved private roads will be "storm-proofed" to minimize runoff of sediments and contaminants from roads to riparian areas and creeks using principals, procedures, and prescriptions described in FishNet4C (2004 and updated 2007) or then current guidance.

- Maintenance of unpaved private roads and shoulders will be conducted using principals, procedures, and prescriptions described in FishNet4C (2004 and updated 2007) or then current guidance.

Private Bridge Measures

- If a bridge becomes structurally unsound and must be replaced, the replacement bridge will be at maximum the same width, unless public safety, environmental, or other legal issues require an increase in size; and in the same location. Stanford will consider replacing an unsound bridge at a more environmentally appropriate location, if there is such a location and it is feasible.

- For bridge repairs and new bridges over creeks, construction will be limited to the dry season and comply with the *General Creek Protection Measures*.

- If an existing bridge is removed, the area will be restored under the supervision of the Conservation Program Manager.

- Vehicular and foot traffic on private bridges will be restricted to authorized uses.

- If a new bridge is needed, Stanford will consult with the Conservation Program Manager to design the new bridge in a manner that minimizes the effects of the bridge on riparian resources. Additional bridges are strongly discouraged; however, replacing culverts or low-water crossings with bridges is encouraged.

Fence Measures

- Any new fences will be designed in consultation with the Conservation Program Manager to minimize potential barriers to general wildlife dispersal. However, fences will allow dispersal by Covered Species except where such dispersal would be detrimental to the species.

- Derelict fences will be removed.

Detention Basin Measures

- After any major runoff producing event, the Conservation Program Manager will survey the storm water detention basins to verify that they are draining. If the ponding lasts longer than 2 days, the Conservation Program Manager will visually survey the basins for the presence of California tiger salamander, and if any California tiger salamanders are found, the Conservation Program Manager will relocate them to more suitable habitat.

- The Conservation Program Manager will be consulted before new off-channel flood control facilities (including any detention or retention basins) are installed. New in-stream facilities are not a Covered Activity.

- Any areas that are disturbed by the installation of new flood control facilities will be restored in accordance with recommendations made by the Conservation Program Manager.

Water Wells Measure

- An education program will be developed by the Conservation Program Manager and presented annually to maintenance workers. The education program will include discussion of the potential for Covered Species to be present near wells and actions that will encourage animals to disperse from the area prior to maintenance work.

- If a Covered Species is found during maintenance of a well, the Conservation Program Manager will relocate the Covered Species to more suitable habitat in Zone 1 or 2.

Academic Buildings Measure

- If a Covered Species is found during maintenance of academic buildings, the Conservation Program Manager will relocate the Covered Species to more suitable habitat in Zone 1 or 2.

4.2.6 Recreation and Athletics

The University has many recreational and athletic facilities that are used by students, faculty, and the public. The most well-known recreational facility is the Stanford golf course. However, in addition to the golf course and driving range, Stanford has miles of trails and pathways that are used for horseback riding, hiking, biking, jogging, and similar recreational activities. Measures to reduce or eliminate the potential effects of these facilities on the Covered Species are set forth below.

Stanford Golf Course. The Stanford golf course has been in place for nearly 80 years, and requires extensive ongoing management. To avoid and minimize the impacts from current and future golf course activities, Stanford will implement the following measures.

Golf Course Measures

- Any changes in golf course management or maintenance techniques that would have an effect on Covered Species will be reviewed by the Conservation Program Manager prior to implementation.

- Golf course modifications will be reviewed by the Conservation Program Manager. Modifications made to existing portions of the golf course are not an expansion of the golf course, provided such modification does not exceed the existing footprint.

- The ball collector on the golf course driving range will not be used on rainy nights during the California tiger salamander migration period (November to April).

- Impacts from biocides and fertilizers have been substantially reduced over the past 5 years, and Stanford will continue to minimize potential impacts from these substances by using spot treatment for pests where required and using slow-release fertilizers.

- New plantings at the golf course will not include species listed on the California Invasive Plant Council list then in effect.

- Feral cat feeding stations will not be allowed.

- A California tiger salamander education program will be developed by the Conservation Program Manager and presented annually to maintenance workers and staff at the golf course and driving range. The education program will include protocols for identification, avoidance, immediate protection, and notification of the Conservation Program Manager. The Conservation Program Manager will have the authority to stop work if a Covered Species is encountered and may relocate the individual to a safer location within Zones 1 or 2.

Recreational Activities. To avoid and minimize the impacts from recreational activities, Stanford will implement the following measures.

Recreational Activities Measures

- Recreational activities that the Conservation Program Manager determines are detrimental to the Covered Species will be restricted or eliminated.
- Recreational areas in Zones 1 and 2 may be used during the daytime only.
- Recreational activities will be limited to developed routes. Enforcement of this limitation will be provided through additions of appropriate signs and fencing, and continued or expanded patrol by Stanford's public safety personnel.
- Unauthorized trails will be reclaimed.
- No dogs will be allowed on recreational trails or routes in Zones 1 and 2 south of Junipero Serra Boulevard, except as allowed by public easement or local law or regulation.
- No vehicles, except service vehicles (University, lessees, and utility companies) and emergency vehicles, will be allowed.
- No access to the creek channels will be allowed except for access by authorized Stanford or emergency personnel.
- New recreational routes[4], including any trails, pathways, or roads, must be reviewed by the Conservation Program Manager. New recreational routes will avoid Zones 1 and 2 to the greatest extent feasible. If any are proposed, they may not be sited through, or within 150 feet of, any creek bank, except to cross bridges.
- No lights or vegetation trimming associated with recreational routes will be allowed in Zone 1 (except trimming associated with trails).
- No recreational hunting or fishing will be allowed.
- California tiger salamander and garter snake education programs will be developed by the Conservation Program Manager and presented annually to maintenance workers and staff at the Equestrian Center. The education program will include protocols for identification, avoidance, immediate protection, and notification of the Conservation Program Manager. The Conservation Program Manager will have the authority to stop work if a Covered Species is encountered and may relocate the individual to a safer location within Zones 1 or 2.

[4] New recreational routes do not include any routes that have been approved by Santa Clara or San Mateo County, including the portions of the C-1 and S-1 trails on Stanford land, before the approval of the HCP.

- The realignment of any recreational route will be reviewed by the Conservation Program Manager, and if the realignment would adversely affect the Covered Species, the realignment may be approved only if it is required for public safety purposes or otherwise legally required. Such realignments will require mitigation unless the Conservation Program Manager determines the new recreational route alignment, with restoration of the old route, would serve as habitat enhancement.

4.2.7 Grounds and Vegetation

Fire Control and Public Safety. To avoid and minimize the impacts from fire control and public safety activities, Stanford will implement the following measures. These measures do not apply to an unplanned fire or other public safety emergency, in which case, emergency personnel may use any methods that are deemed necessary to control and extinguish the fire, and protect human life and property.

Fire Control and Public Safety Measures

- Firebreaks in Zone 1 will be limited to 10- to 15-foot-wide mown, not disced, strips, unless required by a regulatory authority for safety purposes. If a regulatory authority demands a wider firebreak in Zone 1, Stanford and the Service will confer to determine if mitigation for permanent loss of habitat is required.

- Mowing/discing in Zone 1 will be conducted either in the morning when it is still cool or during the hottest part of the day.

- Discing, if used, will be done with a shallow blade that is approximately 4-6 inches deep.

- Mowing or weed whacking will be done to a height of no less than 4 inches.

- New firebreaks must be reviewed by the Conservation Program Manager.

- Restoration efforts following a fire or other public safety emergency will be done under the supervision of the Conservation Program Manager.

Grounds Maintenance. Grounds maintenance activities that are not already covered by a more specific measure (such as those under the *General Infrastructure Measures* in Section 4.2.5), will be subject to the following measures.

Grounds Maintenance Measures

- The Conservation Program Manager will be notified before maintenance of existing landscaping located within Zone 1 is conducted.

- No new landscaping within Zones 1 and 2 will be allowed unless it benefits the Covered Species (e.g., to control invasive plant species) or is required for safety reasons.

- The Conservation Program Manager will be notified if any temporary stockpiling or staging area is required in Zone 1 and it will not be allowed unless associated with existing structures in that zone.

- If feasible, stockpiled materials will be covered in a manner that prevents Covered Species from entering them. The Conservation Program Manager or other qualified biologist will visually survey all stockpiled materials before moving them.

- Stockpiling materials for longer than 1 year constitutes a permanent loss of habitat.

- All ground animal control programs will be discontinued in Zone 1 areas of the California Tiger Salamander Basin, except for formal landscaped or turf areas, or where animal control is necessary for public safety (e.g., squirrel control in the Lagunita berm that is necessary to maintain the dam).

- Vegetation management activities in Zone 1 areas of the California Tiger Salamander Basin will be restricted to mowing or weed whacking to a height of no less than 4 inches. The mowing or weed whacking will take place when the soil is the firmest, and never earlier than 5 days after a rain event. Mowing will be done by the lightest vehicle capable of mowing the area. Discing will be permanently discontinued in Zone 1 areas of the California Tiger Salamander Basin except where it is necessary for increased fire protection or in areas where it is not feasible to mow.

4.2.8 Equestrian and Grazing Leaseholds

Stanford developed Best Management Practices (BMPs) for its equestrian and grazing lessees to use for managing animal waste, compost, and sediment in creeks (Appendix B). In addition, Stanford includes requirements in its leases to prevent overgrazing. To further avoid and minimize the impacts from equestrian and agricultural activities to Covered Species, Stanford will implement the following measures.

Equestrian and Grazing Lessee Measures

- New and renewed leases will include provisions that require lessees that engage in an activity that affects a Covered Species, as determined by the Conservation Program Manager, to update their Best Management Practices (BMPs) every 2 years. The BMPs will be reviewed and approved by the Conservation Program Manager.

- Lessees will be monitored semi-annually by Stanford for compliance with their BMPs. Lessees will be required to address identified problems within a reasonable period of time.

- Structures, crop fields, stables, equestrian creek crossings, and paddocks will be moved out of Zone 1 wherever moving such facilities is feasible.

- No new structures will be allowed in Zone 1.

- The *Recreational Activities Measures* that are applicable to equestrian uses (e.g., use of developed recreational routes) will apply to all equestrian lessees.

4.2.9 Commercial and Institutional Leaseholds

To avoid and minimize the impacts from current and future independent research institutional lessees activities, Stanford will implement the following measures. In addition, the Independent Research Institutional Lessee activities will be subject to the *Existing Utility Measures*, *New Utility Measures*, *General Infrastructure Measures*, and *Grounds Maintenance Measures*.

Independent Research Institutional Lessee Measures

- No new landscaping within Zones 1 and 2 will be allowed unless it benefits the Covered Species (e.g., to control invasive plant species), is required for safety reasons, or is mitigated as loss of habitat.

- Feral cat feeding stations will not be allowed.

- All ground animal control programs will be discontinued, unless they are required for safety reasons (e.g., within 10 feet of buildings).

- California tiger salamander and garter snake education programs will be developed by the Conservation Program Manager and presented annually to maintenance workers and staff. The education program will include protocols for identification, avoidance, immediate protection, and notification of the Conservation Program Manager. The Conservation Program Manager will have the authority to stop work if a Covered Species is encountered and may relocate the individual to a safer location within Zones 1 or 2.

Commercial Leases Measure

- If a Covered Species is found during maintenance of commercial leases in Zones 3 or 4, the Conservation Program Manager will be notified. The Conservation Program Manager will have the authority to stop work if a Covered Species is encountered and may relocate the individual to a safer location within Zones 1 or 2.

4.2.10 Future Development

To avoid and minimize the impacts from future development, Stanford will implement the following measures. These measures apply to the development covered by the GUP, and to any other future development beyond the GUP (Table 4-1).

General Future Development Measures

- Future development will occur predominately in Zones 3 and 4.

- If development occurs in Zones 1 or 2, the appropriate surveys for Covered Species will be conducted prior to final site approval.

- For any development in Zones 1, 2, and 3, and areas of Zone 4 that are within 100 yards of Zone 1, pre-construction surveys for the Covered Species will be conducted in accordance with then-current Service protocols, and any located individuals will be salvaged and relocated to appropriate habitat.

- An on-site biological monitor will be present during all ground-disturbing activity in Zones 1 and 2. The biological monitor will have the authority to stop work if a Covered Species is encountered and may relocate the individual to a safer location within Zones 1 or 2.

- Any development in Zone 1 of the California Tiger Salamander Basin will be reviewed by the Conservation Program Manager to ensure that: New curbs will encourage migration where desirable, or discourage migration into hazardous areas; adverse lighting conditions are minimized; there are adequate garbage facilities; there will be a minimization of ground squirrel control (through, for example, the use of landscaping that does not require pesticides or fertilizers) except as required for public safety; and utility boxes will have as few openings to the surface as possible.

- Construction vehicles in Zones 1 and 2 will be limited to 10 mph, and any fuels stored during construction will be double-contained.

- Any excess asphalt used during construction will be removed upon the completion of construction.

- If a Covered Species is found during construction in Zones 3 and 4, the Conservation Program Manager or another biologist qualified by the Service will relocate the Covered Species to more suitable habitat in Zone 1 or 2.

- For any development in Zones 1, 2, and 3, and areas of Zone 4 that are within 100 yards of Zone 1, open pits, trenches, and excavated areas will be backfilled as soon as possible, and will be secured at the end of every work day in a manner that prevents Covered Species from entering them.

- For any development in Zones 1, 2, and 3, and areas of Zone 4 that are within 100 yards of Zone 1, the construction site will be secured with a solid barrier (e.g., silt fence, plywood, etc.) a minimum of 3 feet tall at the perimeter of the site, buried at least 4 inches into the ground. If the solid barrier coincides with a cyclone fence, the solid barrier will be attached to the outside of the cyclone fence. The barrier will be inspected by an appropriately trained person once a week, and repairs/replacement will be made as necessary.

4.3 ESTABLISHMENT OF MITIGATION ACCOUNTS

Stanford will implement a “mitigation account system” that will (1) establish mitigation lands (and associated mitigation credits) at the outset of HCP implementation; and (2) continuously track the utilization of such mitigation credits over time.

To address impacts to Covered Species in riparian zones, Stanford will create the Matadero/Deer Riparian Account, which will be funded at the outset of HCP implementation by recording a permanent conservation easement over large areas of red-legged frog and garter snake habitat. These lands will be managed in accordance with habitat Monitoring and Management Plan described in more detail in Section 4.3.1.2. Each acre of preserved habitat will constitute 1 credit for mitigation accounting purposes.

To address impacts to California tiger salamanders and garter snakes, Stanford will create a CTS Account. At the outset of HCP implementation, Stanford will establish a large CTS Reserve, and will manage that Reserve in accordance with a habitat Monitoring and Management Plan, as described in Section 4.3.2.2. Stanford will not earn any mitigation credits for these Reserve lands at the outset of the HCP, but will earn credits later when it permanently preserves Reserve lands through recordation of conservation easements. In addition, Stanford will manage an area of the central campus for the benefit of the California tiger salamander and garter snake, as described in Section 4.3.2.4.

During the life of the HCP, Stanford can earn additional credits that will be held in the Matadero/Deer Riparian Account by permanently preserving additional habitat and by enhancing and/or creating additional habitat. Likewise, Stanford will earn credits by permanently conserving habitat in the CTS Reserve, and these credits will be held in the CTS Account. Specifically, Stanford will earn 1 credit for each additional acre of riparian habitat or upland California tiger salamander/garter snake habitat that it permanently preserves, and 25 credits for each acre of permanently preserved tiger salamander breeding habitat. "Breeding habitat," for purposes of earning mitigation credits, is defined as a pond that supports successful California tiger salamander reproduction 3 years within a 6-year period (excluding years of below average rainfall)[5] and includes metamorph dispersal habitat within 50 feet of the pond.

Stanford may increase the amount of credits in the Accounts by enhancing habitat and using the credits at a later date. In this manner, Stanford can take advantage of habitat enhancement opportunities when they arise, and be assured that its efforts to promote the Covered Species may be used to offset later potential habitat losses. The Enhancement Options described in Table 4-2 allow Stanford to earn credits for performing habitat enhancements that are likely to benefit the Covered Species.

Table 4-2 is not an exhaustive list of possible enhancements. If other enhancements are identified during the life of the HCP, Stanford will earn credits for those enhancements that are consistent with the allocation of credits presented in Table 4-2. The number of credits that Stanford will earn for enhancing existing and potential habitat varies depending upon the benefit to the Covered Species, cost, and difficulty in implementing the enhancement.

Prior to performing any restoration or enhancements, Stanford will prepare a plan that describes the proposed enhancement and/or restoration, minimum and long-term success criteria, monitoring plan, and number of credits to be awarded. The plan will describe when and under

[5] With the approval of the Service, Stanford may exclude years with average or above average rainfall from this calculation if rainfall patterns resulted in a situation where successful reproduction would not be expected to occur.

what circumstances credits will be awarded; and, in general, credits or partial credits will be awarded when the minimum success criteria are achieved. This plan will be approved by the Service.

Enhancements and preservation within the Matadero/Deer Creek Basin will be credited to the Matadero/Deer Riparian Account. The boundary of the Basin is shown on Figure 4-3.

Permanent land preservation within the CTS Reserve will be credited towards the CTS Account. Stanford may enhance tiger salamander habitat at any time, and has already constructed eight new potential breeding ponds. During the period 2005-2011, Stanford experienced average or above average seasonal rainfall during 5 of those 7 years. In that time California tiger salamanders bred successfully five times in Pond #1, twice in Pond #5, and twice in Pond #2 (Figure 2-4). Pond #1 therefore meets the definition of "breeding habitat." However, no credits will be awarded for these enhancements until a permanent conservation easement is recorded over the habitat. The boundary of the CTS Reserve is shown on Figure 4-4.

As described in Section 4.4, Stanford will withdraw credits from the Accounts whenever it permanently converts any land within Zones 1, 2, or 3. Permanent conversion will generally result from future development, but also may occur from other activities, such as landscaping or the construction of new roads. The Account from which Stanford will withdraw the credits depends upon the location of the converted land, and the amount of the withdrawal depends upon the Zone in which the converted land is located. For example, Stanford would withdraw credits from the CTS Account if a new project adversely affects any Zone 1, 2, or 3 habitat in the California Tiger Salamander Basin, which is shown on Figure 4-4. Alternatively, new development in Zone 1, 2 or 3 within the Matadero/Deer Creek Basin (Figure 4-5) would require Stanford to withdraw credits from the Matadero/Deer Riparian Account.

4.3.1 Matadero/Deer Riparian Account

4.3.1.1 Matadero/Deer Easement

Within 1 year of approval of this HCP and issuance of the Section 10(a) authorizations, Stanford will fund the Matadero/Deer Riparian Account by recording a permanent conservation easement over 90 acres of the most biologically sensitive portions of Matadero and Deer creeks and adjacent riparian lands. The easement area is shown on Figure 4-3. The 90-acre Matadero/Deer Easement will cover Zone 1 lands, and includes the riparian zone, which is all of the undeveloped land within 150 feet of the top of the creek bank, the creek channels, and a portion of small tributary of Matadero Creek that originates in an abandoned quarry. Part of the Matadero/Deer Easement is covered by annual grassland, oak woodland, and rock outcrops.

The Matadero Creek watershed, which includes Deer Creek, is relatively small, approximately 7.25 square miles. Matadero and Deer creeks are part of a single watershed, and display similar characteristics, thus forming a convenient and consistent management unit. The Matadero/Deer Easement will be managed for the benefit of the California red-legged frog and garter snake in accordance with the Matadero/Deer Easement Monitoring and Management Plan described below.

4.3.1.2 Matadero/Deer Easement Monitoring and Management Plan

Stanford will implement the following management and monitoring measures.

- Surveys for the red-legged frog and garter snake and of their habitat will be conducted in accordance with the monitoring plan set forth in Section 4.6 for the term of this HCP.

- If the monitoring program results show the presence of non-native animal species that could adversely affect Covered Species within the Easement area, the non-natives will be removed, to the extent that Stanford can feasibly remove or control them. Before trapping is used to remove the non-natives in areas where any Covered Species may occur, Stanford will submit a plan to the Service for approval.

- If the monitoring program results show that non-native plant species could adversely affect Covered Species or their habitat within the Easement area, the non-natives will be removed, to the extent that Stanford can feasibly remove or control them.

- If the surveys determine that wildlife species have been placed within the Easement area, Stanford will post signs prohibiting the release of any wildlife species in the ponds and/or fence as necessary.

- In addition to providing annual results of the monitoring program to the Service Stanford will share the monitoring results with other interested local, state and federal conservation agencies.

- Within 3 years of the Service's issuance of an incidental take permit and approval of the HCP, Stanford will conduct a hydrologic study to determine the feasibility of enhancing the quarry pond in a manner that improves red-legged frog reproduction[6], and submit an enhancement proposal to the Service that describes the nature of the proposed enhancement measures and a proposed timeline for implementing the enhancement measures (including securing all necessary permits or approvals). In addition, Stanford will evaluate the creek corridor and identify where two new California red-legged frog breeding ponds may be constructed. Stanford will provide the Service with a proposal within 5 years to construct these new seasonal ponds. The proposal will include the location, size, shape, and depth of the new ponds, short-term success criteria for the ponds (e.g., minimum ponding time and depth and vegetation cover), and a long-term monitoring plan for the ponds. The long-term monitoring will be consistent with the California red-legged frog monitoring protocols outlined in Section 4.6.

- Stanford will study the feasibility of installing water monitoring stations in Matadero and Deer creeks, and if it is feasible, Stanford will install water monitoring stations in the creek(s).

- Stanford will initiate revegetation efforts along stream banks and adjacent upland areas that are subject to erosion.

[6] The 3-year timeframe assumes that weather conditions have been sufficient to provide data for a hydrologic study. If there have been drought conditions, the timeframe will be extended to allow for the drought years.

- Stanford will erect fences in the areas where the Conservation Program Manager determines they are needed to keep livestock and unauthorized persons out of the Easement.

- Stanford will initiate stabilization efforts along stream banks and adjacent upland areas that are subject to erosion (use of biological stabilization methods will be strongly encouraged), and create a pilot program for streambank protection that could be used as a community resource.

- Feral cat feeding stations will not be allowed in the Easement area, or within 150 feet of the Easement.

- No new permanent structures may be erected on lands covered by the Matadero/Deer Easement unless the structures are for the benefit of the Covered Species or they are necessary for safety reasons. This prohibition does not preclude maintenance and improvement of existing structures, including utilities, roads, and buildings. Structures used to study the geomorphological, hydrological, and biological characteristics of the creeks and surrounding uplands will be allowed if they provide information that contributes to the management of the Covered Species. New bridges are not precluded from the Matadero/Deer Easement, but will require additional mitigation in accordance with Section 4.4 if the new bridge results in the permanent loss of habitat. The Conservation Program Manager will be consulted before any permanent structures are erected, and such structures will be designed to minimize or avoid impacts to the Covered Species.

- Any new conservation easements within the Matadero/Deer Creek Basin will be subject to the Matadero/Deer Easement Monitoring and Management Plan. Stanford will consult with the Service before recording any new conservation easements within the Matadero/Deer Creek Basin.

- Five years before the expiration of the HCP and associated incidental take permit, Stanford will prepare a long-term monitoring and management plan that incorporates management and monitoring techniques that have been demonstrated to be the most successful. The long-term monitoring and management plan will include protocols for monitoring the abundance of Covered Species in the Easement area and the quality of preserved habitat, invasive species monitoring and management, an adaptive management provision, and any other monitoring or management techniques that Stanford deems necessary to fulfill the conservation purpose of the Matadero/Deer Conservation Easement. This monitoring and management plan will survive the expiration of the incidental take permit and this HCP, and will be subject to review and approval by the Service.

4.3.1.3 Matadero/Deer Riparian Account Credits

Stanford will earn 90 credits for recording the 90-acre Matadero/Deer Easement and implementing the Matadero/Deer Easement Monitoring and Management Plan. These credits will be withdrawn from the Matadero/Deer Riparian Account to mitigate for future development

projects or other permanent land conversions. The number of credits that Stanford will earn for preserving additional land or performing habitat enhancements will be calculated in accordance with Table 4-2.

4.3.2 CTS Account

Stanford has developed a comprehensive program to manage existing California tiger salamander and garter snake habitat, improve and enhance California tiger salamander and garter snake habitat, and mitigate for future losses of habitat for these species within the California Tiger Salamander Basin. This program includes the creation of a CTS Reserve and an accompanying Monitoring and Management Plan that are described in Sections 4.3.2.1 and 4.3.2.2, and the implementation of a Central Campus CTS Management Plan that is described in Section 4.3.2.4.

4.3.2.1 CTS Reserve

Within 1 year of approval of this HCP and issuance of the Section 10(a) authorizations, Stanford will create a CTS Reserve south of Junipero Serra Boulevard and implement a CTS Reserve Monitoring and Management Plan. The CTS Reserve includes approximately 315 acres of currently occupied and potential tiger salamander and garter snake habitat (Figure 4-4). The CTS Reserve contains eight California tiger salamander breeding ponds that Stanford constructed during the preparation of this HCP. California tiger salamander reproduction has already been documented in three of those ponds, and California tiger salamanders that breed at Lagunita already migrate to this area. The ponds, presence of amphibian prey, and grasslands in the CTS Reserve also provide high quality garter snake habitat.

The creation of the CTS Reserve implements two of the Biological Goals of the HCP, which are to stabilize the local California tiger salamander population and increase its chance of long-term persistence at Stanford, and to maintain CTS ponds to promote CTS reproduction in the Foothills. By so doing, Stanford will reduce California tiger salamander reliance on Lagunita, which requires supplemental water and extensive maintenance to support tiger salamander reproduction. Likewise, the CTS Reserve and accompanying Monitoring and Management Plan will benefit the garter snakes and reduce their reliance on Lagunita, which because of its urban location, has many threats to the garter snake population.

The CTS Reserve will also provide a means for mitigating the permanent loss of Zone 1, 2, and 3 habitat within the California Tiger Salamander Basin as described in Section 4.3.2.3.

4.3.2.2 CTS Reserve Monitoring and Management Plan

Stanford will preserve and enhance the quality of potential and existing tiger salamander and garter snake habitat within the CTS Reserve by implementing a CTS Reserve Monitoring and Management Plan. This Monitoring and Management Plan will consist of the following monitoring and management measures.

- Surveys for California tiger salamander and garter snake and of their habitat will be conducted in accordance with the monitoring program set forth in Section 4.6 for the term of this HCP.

- If the monitoring program results show that non-native wildlife species are adversely affecting the Covered Species, such as through direct kill or alteration of the habitat to the extent that it reduces its suitability, the non-natives will be removed, as allowed by law and to the extent that Stanford can feasibly remove or control them. Before trapping is used to remove the non-natives in areas where any Covered Species may occur, Stanford will submit a plan to the Service for approval.

- If the monitoring program results show that non-native plant species could adversely affect Covered Species or their habitat within the Reserve area, the non-natives will be removed, to the extent that Stanford can feasibly remove or control them.

- If the monitoring program results show that wildlife species have been placed in ponds within the Reserve area, Stanford will post signs prohibiting the release of any wildlife species in the ponds and/or fence the ponds as necessary.

- If monitoring determines that non-native species remain a threat to Covered Species despite Stanford's efforts at removal for 3 years, Stanford will consult with the Service to determine an appropriate plan of action.

- In addition to providing annual results of the monitoring program to the Service, Stanford will share the monitoring results with other interested local, state and federal conservation agencies.

- If the California tiger salamander habitat surveys find that the seasonal ponds are not facilitating tiger salamander breeding, the pond(s) will be modified or eliminated. Modifications to the pond(s) may include expanding or reducing the size of the pond, making the pond deeper or shallower, or providing a temporary water source. Stanford will consult with the Service regarding any proposed pond modifications.

- If there are 3 consecutive years of inadequate rainfall to sustain adequate larval development, Stanford will consult with the Service regarding ways to provide supplemental water to the constructed breeding ponds.

- If surveys indicate that tiger salamanders would benefit from the addition of cover or egg-laying substrate in the created ponds, Stanford will place suitable material in the ponds.

- Stanford will enhance tiger salamander and garter snake dispersal by mowing or grazing up to 2 acres of grassland adjacent to each of the newly created California tiger salamander breeding ponds annually during the summer. Mowing will be done either in the morning when it is still cool or during the hottest part of the day.

- If the California tiger salamander surveys find that the tiger salamanders would benefit from additional burrows, Stanford will enhance upland habitat adjacent to the newly created breeding ponds by creating cover piles to attract ground squirrels. Cover piles will typically be made of natural materials such as logs and rocks placed in a pit and backfilled with soil to create a mound, similar to those already created around existing ponds**.** Pits are generally up to 60 square feet and up to 4 feet deep. The cover piles will

be located within 150 feet of the newly created breeding ponds. New cover piles will be created during the dry season, between June and September.

- The presence of oak woodland and savannah grasslands within 150 feet of the newly created breeding ponds will be maintained, and Stanford will minimize the presence of chaparral grasslands (through hand removal, mowing, grazing, or spot application of pesticides if necessary).

- Stanford will maintain at least three amphibian tunnels across Junipero Serra Boulevard. If the results of the annual monitoring program show the amphibian tunnels are facilitating migration across Junipero Serra Boulevard and that additional tunnels would benefit tiger salamander migration, Stanford may install additional amphibian tunnels. Stanford would identify an appropriate location for the additional amphibian tunnel(s) based on the results of the annual monitoring program, and, before installing any new amphibian tunnels, obtain the Service's concurrence regarding the location of the new tunnel(s).

- Recreational access will be limited to existing service roads and restricted to daylight hours.

- No dogs will be permitted in the CTS Reserve.

- The Conservation Program Manager will review any proposed academic uses within the CTS Reserve, and if necessary, impose use conditions and restoration measures.

- Development, such as academic buildings, residential dwelling units, or commercial buildings, will be prohibited. Utilities and other general infrastructure improvements that would not adversely affect the tiger salamander habitat may be placed within the CTS Reserve. However, these improvements will be reviewed by the Conservation Program Manager, and if necessary, the Conservation Program Manager may impose use conditions and restoration measures.

- A California tiger salamander and garter snake education program will be developed by the Conservation Program Manager and presented to Stanford maintenance personnel and contractor personnel working in, or immediately adjacent to, the CTS Reserve. The education program will include protocols for identification, avoidance, immediate protection, and notification of the Conservation Program Manager.

- Feral cat feeding stations will not be allowed in the CTS Basin south of Junipero Serra Boulevard. Any feral cat feeding stations found in these areas will be removed.

- All ground animal control programs will be discontinued in the CTS Reserve.

- Vegetation management activities in the CTS Reserve will be conducted to achieve the goal of improving CTS habitat.

- Prior to recording the first conservation easement within the CTS Reserve, Stanford will prepare a CTS Easement Monitoring and Management Plan that specifically describes (1)

how Stanford will monitor and maintain a suitable hydroperiod of any preserved breeding habitat or potentially suitable breeding habitat, including measures Stanford will take to provide supplemental water if needed to support successful tiger salamander reproduction (if surveys indicate that tiger salamander larvae are present, but forecasts indicate insufficient rain to sustain tiger salamander breeding ponds through metamorphosis), (2) vegetation and sediment management measures, including suitable vegetation to facilitate tiger salamander dispersal between preserved breeding and upland habitat, (3) measures to maintain a suitable number of ground squirrel burrows within preserved upland habitat areas, and (4) an adaptive management plan. Stanford will submit a draft Easement Monitoring and Management Plan to the Service no less than 60 days prior to recording the first conservation easement within the CTS Reserve, and all future habitat preserved within the CTS Reserve will be subject to the approved plan.

- Five years before the expiration of the HCP and associated incidental take permit, Stanford will prepare a long-term monitoring and management plan for all habitat within the CTS Reserve that has been permanently preserved. The long-term monitoring and management plan will incorporate management and monitoring techniques that have been demonstrated to be the most successful. The long-term monitoring and management plan will include protocols for monitoring the abundance of California tiger salamanders and garter snakes in permanently preserved areas and the quality of preserved habitat, invasive species monitoring and management, an adaptive management provision, and any other monitoring or management techniques that Stanford deems necessary to fulfill the conservation purpose of the conservation easement(s) recorded during the term of the HCP. This monitoring and management plan will survive the expiration of the incidental take permit and this HCP, and will be subject to review and approval by the Service.

4.3.2.3 Use of CTS Reserve to Mitigate Future Development

Stanford will also use the CTS Reserve to mitigate for any future losses of Zone 1, 2 or 3 habitat within the California Tiger Salamander Basin (Figure 4-4). Currently, Stanford does not have any plans to develop any Zone 1, 2, or 3 land within the California Tiger Salamander Basin. However, if development occurs within the California Tiger Salamander Basin during the term of the HCP, Stanford would mitigate the loss of habitat by recording a permanent conservation easement over habitat within the CTS Reserve prior to groundbreaking in accordance with the ratios described in Section 4.4. Stanford may accrue mitigation credits by recording larger easements than are necessary to mitigate for a particular project. Surplus mitigation credits will be held in the CTS Account, and Stanford may use them at a later date to mitigate for future development projects or other permanent land conversions.

By requiring Stanford to permanently conserve habitat within the CTS Reserve, the HCP ensures that the permanent loss of habitat will be mitigated by the permanent conservation of habitat. The permanent conservation easements would first be recorded in areas that contain breeding ponds and immediately adjacent upland habitat, and subsequently recorded easements would expand outward from there. All of the conservation easements would be contiguous, and over time a single large block of permanently preserved California tiger salamander breeding and upland habitat would be established. Before recording any conservation easements, Stanford will consult with the Service regarding the location of the new easement.

4.3.2.4 Central Campus CTS Monitoring and Management Plan

As discussed in Chapter 2, California tiger salamanders currently breed at Lagunita, an artificially created reservoir that is supported by diversions of water from San Francisquito Creek.

Governor Stanford began diverting water to Lagunita in the late 1800s to provide stock water and store irrigation water. Later, Stanford University diverted water to Lagunita to support aquatic recreational activities. However, Stanford no longer uses Lagunita for stock water, water storage, or recreational purposes, but has continued to divert water from San Francisquito Creek to sustain California tiger salamander reproduction. Lagunita also currently provides some flood control functions, and naturally retains some water during the rainy season. However, without the water diversions, in most years Lagunita would not naturally hold enough water for California tiger salamander reproduction. The practice of withdrawing water from San Francisquito Creek and diverting it to Lagunita to facilitate California tiger salamander reproduction can adversely affect biological resources (including steelhead) in the creek.

Lands north, east, and west of Lagunita are developed with urban facilities and do not provide sustainable upland habitat. Consequently, tiger salamanders that breed at Lagunita generally migrate south and across Junipero Serra Boulevard to upland habitat in the undeveloped foothills that will now be part of the CTS Reserve. Junipero Serra Boulevard is a heavily traveled County roadway, and numerous California tiger salamanders are killed annually while migrating across the roadway.

Garter snakes also are sometimes found around Lagunita. However, because Lagunita is regularly used by students, and other people, and lands north, east, and west of Lagunita are already developed with urban facilities including roads, the area does not provide long-term suitable habitat. Garter snakes, like the California tiger salamanders, also are likely killed while crossing roads, and would benefit from habitat management in the foothills.

Since much of Stanford's California tiger salamander population and garter snake population is currently concentrated around Lagunita, Stanford will implement a Central Campus CTS Monitoring and Management Plan that will govern the management of the approximately 95 acres of Zone 1 and 2 California tiger salamander and garter snake habitat north of Junipero Serra Boulevard, including Lagunita (i.e., the "Central Campus CTS Management Area" shown in Figure 4-4). This Central Campus CTS Monitoring and Management Plan will consist of the following monitoring and management measures.

- Surveys for the California tiger salamander and garter snake and their habitat will be conducted in accordance with the monitoring program set forth in Section 4.6 for the term of this HCP.[7]

[7] While the San Francisco garter snake is the Covered Species, monitoring will consider all garter snakes in order to gather data on the species and its subspecies. Because garter snakes have been found in Lagunita, surveys for the San Francisco garter snake will be performed in the Central Campus CTS Management Plan area.

- If the monitoring program results show that non-native species are adversely affecting Covered Species within the Central Campus CTS area, such as through direct kill or alteration of the habitat to the extent that it reduces its suitability to support the species, the non-natives will be removed, as allowed by law and to the extent that Stanford can feasibly remove or control them. Before trapping is used to remove the non-natives in areas where any Covered Species may occur, Stanford will submit a plan to the Service for approval.

- If the monitoring program results show that non-native plant species could adversely affect Covered Species or their habitat within the Central Campus CTS area, the non-natives will be removed, to the extent that Stanford can feasibly remove or control them.

- If the surveys determine that wildlife species have been placed in Lagunita, Stanford will post signs prohibiting the release of any wildlife species in Lagunita.

- Continue to operate Lagunita consistent with the Lagunita operations plan described in Section 3.1.

- Development, such as academic buildings, residential dwelling units, or commercial buildings, will be prohibited in the Lagunita area that is shown on Figure 5-1.[8] Utilities and other general infrastructure improvements that would not adversely affect the tiger salamander habitat and tiger salamander dispersal may be placed within the Lagunita area. However, these improvements will be reviewed by the Conservation Program Manager, and if necessary, the Conservation Program Manager may impose use conditions and restoration measures.

- No biocides will be applied to Lagunita for schistosome cercarial dermatitis (swimmer's itch) without prior approval of the Conservation Program Manager.

- The bed of Lagunita will be mowed to not less than 4 inches, instead of being disced, for fire protection in the summer after consultation with the Conservation Program Manager. Mowing will be done by the lightest vehicle capable of mowing the area and will be done either in the morning when it is still cool or during the hottest part of the day.

- Ill-fitting utility box covers within 1,500 feet of Lagunita will be retrofitted to exclude California tiger salamanders.

- The use of off-road vehicles in Lagunita will be prohibited and the Conservation Program Manager will inspect Lagunita monthly to ensure compliance with the prohibition.

- Feral cat feeding stations will not be permitted in the Central Campus CTS Management Area, or within 150 feet of the Central Campus CTS Management Area.

[8] If the HCP is amended or authorization is otherwise granted by the Service to allow development within the Lagunita area, Stanford will ensure that a minimum of three breeding ponds in the CTS Reserve have achieved the success criteria described in Section 4.3 before such development occurred.

- A California tiger salamander and garter snake education program will be developed by the Conservation Program Manager and presented annually to maintenance workers that regularly work in the Central Campus CTS Management Area and to contractor personnel before they begin work in the Central Campus CTS Management Area.

4.4 USE OF MITIGATION ACCOUNT CREDITS

The development or other conversion of existing Zone 1, 2, or 3 habitat will adversely affect the Covered Species. Credits will be withdrawn from the Matadero/Deer Riparian Account in accordance with the ratios described below for any loss of habitat within Zone 1 or 2 or land in Zone 3 in the Matadero/Deer Creek Basin. Likewise, credits will be withdrawn from the CTS Account in accordance with the ratios described below for any loss of habitat within Zone 1 or 2, or land in Zone 3 in the California Tiger Salamander Basin. Zone 1, 2, or 3 habitat may be lost 1) directly through development, which would include the footprint of any new structure, landscaping, or new impervious surface commonly associated with development; and 2) indirectly if new development isolates areas beyond the footprint of the new development. For example, an indirect loss of habitat would occur if new development is sited in a manner that isolates breeding or upland habitat. Under the HCP, the isolated habitat is a loss of habitat that would require mitigation. The Conservation Program Manager will review all new development in Zones 1, 2, and 3 and determine the actual loss or conversion of habitat.

To mitigate for the loss of Zone 1, 2, or 3 habitat within the California Tiger Salamander Basin, mitigation will take the form of either a withdrawal of credits from the CTS Account (if credits have been accrued as discussed above), or by permanently recording a conservation easement over land within the CTS Reserve, in accordance with the ratios described below.

Every acre of Zone 1 habitat that is permanently converted will require three mitigation credits, every acre of Zone 2 habitat will require two mitigation credits, and every acre of Zone 3 land will require 0.5 mitigation credits. Development in Zone 4 will not adversely affect the Covered Species, because Zone 4 does not provide suitable habitat for the Covered Species. Therefore, no mitigation credits are required for development in Zone 4 (Table 4-3).

Under the HCP, Stanford will have to withdraw credits from the Matadero/Deer Riparian Account or CTS Account to offset habitat lost to development or other activity that results in the permanent conversion of land in Zone 1, 2, or 3. Stanford will offset the loss of habitat by withdrawing credits from the appropriate mitigation Account. By requiring Stanford to pay for development with existing credits, or to earn new credits before habitat is lost to development, mitigation will always stay ahead of development.

Any permanent conversion of Zone 1, 2, or 3 habitat must be paid for from the appropriate Account. Any development or permanent conversion of land in Zone 1, 2, or 3 within the Matadero/Deer Creek Basin (Figure 4-3) must be mitigated for by withdrawing credits from the Matadero/Deer Riparian Account. Any development within the California Tiger Salamander Basin (Figure 4-4) will be paid for from the CTS Account.

4.5 ADAPTIVE MANAGEMENT

4.5.1 Adaptive Approach

Adaptive management is an iterative system of decision making that is particularly useful in the face of uncertainty. Adaptive management employs a "learning by doing" approach to resource management that reduces the uncertainty that is inherent in resource management.

Adaptive management begins by using predictive modeling based on present knowledge to inform management and resource conservation decisions. As new knowledge is gained, the models are updated and management decisions adapted accordingly.

Key features of the HCP's adaptive management are:

- Iterative decision-making (evaluating results and adjusting actions on the basis of what has been learned through monitoring);
- Feedback between monitoring and decisions (learning); and
- Measuring success of the Conservation Program in light of the HCP's Biological Goals and Objectives.

Based on the best scientific information currently available, Stanford expects that the HCP's Conservation Program will effectively achieve the HCP's Biological Goals and Objectives. However, there is always some uncertainty with resource management techniques and a risk that habitat conditions will change in unexpected ways. It is also possible that new and different management techniques that are not identified in the HCP will prove to be more effective in achieving the Biological Goals and Objectives, and that scientific data will provide new information about the ecology of the Covered Species and their habitat needs.

Adaptive management is a process by which the Conservation Program for the HCP may be adjusted over time to reflect new information on the life history or ecology of the Covered Species generated through new information on the effectiveness of the various minimization and mitigation measures (in particular, enhancement and management activities). Moreover, the HCP recognizes that conditions at the University may change over the life of the HCP, and this provision provides Stanford with an opportunity to further benefit the Covered Species in the future in response to changed conditions. The adaptive management provision addresses the process for revising the Conservation Program, including changes to the enhancement and management techniques, the use of experimental techniques in enhancement and management activities, revising various plans adopted pursuant to the HCP, emergencies, and reintroducing Covered Species. Other protected species historically found in the region may be proposed for reintroduction at Stanford. Any reintroduction will require active coordination between Stanford and the appropriate resource agency, and may require an amendment to this HCP.

4.5.2 Role of Monitoring in Adaptive Management

Stanford is responsible for monitoring the status of the Covered Species and the effectiveness of the Conservation Program. The monitoring program implemented under the HCP will evaluate:

- The success of management measures in preserving the quality of existing habitat;
- The success of enhancement measures;
- Species response to habitat conditions;
- Trends in habitat conditions and the Covered Species' population

Monitoring is the cornerstone of adaptive management. Monitoring yields results that inform management decisions. It provides data that Stanford will rely on to identify successful management and monitoring techniques that are achieving the HCP's Biological Goals and Objectives, and identify ineffective management and monitoring techniques. In this way, the monitoring program also provides valuable data for assessing the success of the Conservation Program in meeting the HCP's Biological Goals and Objectives.

4.5.3 Modification to the Conservation Program

During the life of the HCP, Stanford may modify the Conservation Program to reflect new scientific or technical information (such as the adoption of a federally approved Species Recovery Plan described further in Section 6.9.4), the designation of Critical Habitat, or if the monitoring program shows that measures provided for in the HCP are ineffective or that Stanford is not progressing towards achieving the HCP's Biological Goals and Objectives. Minor amendments may be required as management practices progress and improve. Likewise, as the University and technologies for running the University evolve, some of the Covered Activities may change to reflect that evolution. The minimization measure may change to adapt to those changes in the University's Covered Activities. Adaptive management may be used to modify the Conservation Program to reflect these changes. Modifications made through adaptive management would generally reflect changes to the management of the habitat or the performance of new conservation-related activities and will be limited to:

- changes to monitoring methodologies and timing, including those resulting from ongoing research on the Covered Species;
- changes to the monitoring methodologies or management techniques based on the adoption of a federally approved Species Recovery Plan or designation of Critical Habitat;
- decisions to develop population viability indices having to do with specific population monitoring techniques;
- any revisions of a minor or technical nature to the monitoring and management plans developed under this HCP;
- changes to Best Management Practices;
- changes to the Minimization Measures pursuant to Section 4.5.4, below;

- minor changes or additions to the Covered Activities that do not introduce significant new biological impacts into the Matadero/Deer Easement or CTS Reserve, or result in significant new or different environmental impacts; and

- any other revision of a technical nature that is consistent with the overall biological intent of the HCP and does not introduce significant new biological conditions into an area covered by the HCP or result in significant new or different environmental impacts.

Any changes made pursuant to this section will be described in the Annual Report (described in Section 6.4).

4.5.4 Revisions to the Conservation Measures

If the Annual Report (required under Section 6.4 of the HCP) or other biological monitoring reports indicate consistent population declines in a Covered Species when compared to population numbers provided in previous reports, and the best available scientific data indicate that the consistent population decline is attributable to an activity being performed by Stanford, then Stanford and the Service will meet and confer to determine if the minimization and/or land management and conservation measures described in Section 4.2 are inadequate or may be responsible for or contributing to the population declines. If the parties agree that the best available scientific information shows that the minimization measures are responsible in whole or in part for such population declines, and if new techniques of substantially equal cost are available for more effectively implementing the measures, then revisions to Section 4.2 of the Conservation Program will be made as soon as practicable. Any such changes will be reviewed and approved by the agency with jurisdiction over the particular Covered Species before any changes are implemented, and will be made in accordance with the process set forth in Section 6.7.2, under Minor Modifications.

4.5.5 Revisions to the Monitoring and Management Plans

Under the Conservation Program, Section 4.3, Stanford is required to implement multiple Monitoring and Management Plans for the benefit of the Covered Species. These Monitoring and Management Plans are intended to gauge the effectiveness of the HCP's Conservation Program in achieving the Biological Goals and Objectives, and to preserve and enhance the conservation value of the Matadero/Deer Easement, CTS Reserve, or Central Campus CTS Management Area. However, if the Annual Report or other biological monitoring reports indicate a consistent population decline for a Covered Species when compared with previous reports, and the best available scientific data indicates that the consistent population decline is attributable to an activity being performed by Stanford, then Stanford and the Service shall meet and confer to determine whether or not the management techniques (and if so, which management techniques) require adjustment to reverse the population declines.

If Stanford, with the concurrence of the Service, concludes that management techniques are either entirely or partially responsible for population declines of a Covered Species, then revisions will be made to the appropriate management techniques. Some examples of appropriate changes include:

- Replace techniques with a more effective technique: The preferable method for solving any problems with a management technique is to eliminate a management technique that has yielded little or no measurable benefits to the Covered Species and re-direct those resources to alternative strategies that are more likely or proven to provide enhanced benefits to the Covered Species. A new method will be employed if it is roughly equivalent in cost to the eliminated technique.

- Add new management techniques: In some cases, new management techniques may be essential to assist in maintaining the Covered Species populations but Stanford cannot implement the new techniques without raising the overall cost of managing the Matadero/Deer Easement, CTS Reserve, or Central Campus CTS Management Area. In such cases, the new management techniques may be implemented, but only if funding sources (e.g., state or federal funds) are obtained such that the overall costs of implementing the HCP are not increased.

Alternatively, if new techniques that may improve habitat quality or Covered Species survival become available, even if no detectable Covered Species population decline has been noted, then Stanford may meet and confer with the Service to determine if the implementation of such new techniques is desirable.

Likewise, Stanford may find that the monitoring techniques are ineffective, or that more effective monitoring techniques may exist. For example, field surveys may fail to encounter the Covered Species or only rarely encounter remnant populations of a Covered Species such that the biological data gathered from the surveys fails to provide suitably reliable evidence of the success of the HCP. Similarly, Stanford may, from time to time, need to revise the methods and techniques for surveying or otherwise monitoring the Covered Species in order to provide meaningful data, to respond to new scientific information, or to respond to the results and experiences of current monitoring methodologies. If Stanford, with the concurrence of the Service, concludes that the monitoring techniques being used are inadequate or that better techniques are available, then revisions to the appropriate techniques may be made. Stanford will meet and confer with the Service regarding any new monitoring technique. The new techniques may be implemented if Stanford determines they are feasible, and the Service concurs that the new technique will provide more reliable or efficient data, without creating any new adverse effects on the Covered Species.

Any changes made pursuant to this section will be described in the Annual Report (Section 6.4).

4.5.6 Experimental Techniques

The HCP does not require the use of new or untested techniques. However, from time to time, Stanford may find that a new but untested or different technique has the potential to improve habitat quality or to improve the survival of the Covered Species. This section describes the requirements for incorporating such new or different techniques into the HCP.

If a management technique is new or untested at Stanford (and many are, since the art and science of natural land management and restoration are constantly changing), the technique should be treated as a new technique. The need for the technique should be carefully

documented and reviewed by scientific peer review and should, if at all possible, be carried out on a small scale prior to treating large portions of land that might represent a significant percentage of habitat for a target Covered Species. If the technique proves successful, it may be used on a larger scale. At every stage, the actual methods used must be documented and the results monitored to test whether the anticipated effect on the habitat and the actual effect on the target Covered Species' populations are achieved.

Prior to undertaking an unproven enhancement or management technique in the Matadero/Deer Easement, CTS Reserve, or Central Campus CTS Management Area, Stanford will meet and confer with the Service to determine appropriate methodologies and protocols, the total acreage that would be subject to the new techniques, and the success criteria which must be demonstrated by the new technique before the experimental technique may be extended. Implementation of such measures or new techniques shall require the concurrence of the agency with jurisdiction over the particular Covered Species that would be affected.

4.6 HCP MONITORING PROGRAM

This section describes the HCP's monitoring program. However, it will likely evolve during the life of the HCP through the adaptive management process. Adaptive management will be employed to add new monitoring techniques, modify these monitoring methods or eliminate monitoring methods that prove ineffective or that have unanticipated impacts on the Covered Species. To maintain an internally consistent and comparable dataset, methods will be used as long as they are providing useful information and not having unanticipated impacts on the Covered Species, and any changes to the methods will be reported in the Annual Report.

As discussed in Section 4.5, the monitoring program has been developed, in part, to measure the Conservation Program's success in achieving the HCP's Biological Goals and Objectives, and monitoring is an important component in the adaptive management process. The monitoring program outlined below will provide data on the distribution and abundance of the Covered Species, their habitats, and potential threats. Using these data, Stanford will be able to assess changes in the quality and quantity of the specific habitat of the Covered Species, identify significant changes in the populations of the Covered Species, measure progress towards meeting the HCP's Biological Goals and Objectives, and decide if changes in management or monitoring are warranted. The results of the annual monitoring activities will also inform management decisions, including restoration efforts and invasive species removal.

The monitoring program has been organized by species, although monitoring activities will be aggregated during the implementation of the HCP for several species that use the same habitat. For example, Matadero Creek provides habitat for red-legged frogs and garter snakes, so several of the monitoring activities that pertain to these species may be done at the same time. In this way, Stanford will minimize the potential impacts of these monitoring activities on the species.

The Conservation Program Manager will serve as the primary responsible individual for the taking of any Covered Species that may occur during the course of implementing the HCP's monitoring program. All monitoring activities will be performed under the Conservation Program Manager's guidance and supervision, or under the guidance and supervision of an agency-approved assistant Conservation Program Manager. Stanford will ensure that the lead or

assistant Conservation Program Manager is onsite during all monitoring activities. Prior to the implementation of the HCP, Stanford will provide the Service with resumes for the Conservation Program Manager and any assistant Conservation Program Manager(s) for approval. Stanford will notify the Service no less than 14 days in advance of any monitoring activities if there is a new lead or assistant Conservation Program Manager, and provide them with a resume or similar description of qualifications. Stanford University scientists and students will generally assist the lead or assistant Conservation Program Manager with implementing the HCP's monitoring activities.

Prior to the implementation of the HCP, the Conservation Program Manager will prepare a training program to ensure that all individuals performing monitoring activities have qualifications, knowledge and experience relevant to the type of research and monitoring activities that are being performed. A list of all individuals who participated in the monitoring activities and copies of training materials will be submitted to the Service with the Annual Report (described in Section 6.4).

The Conservation Program Manager may engage third parties (such as biological consultants with specific technical expertise regarding a Covered Species) who are qualified and authorized by the Service to conduct, or to directly supervise, activities conducted under the HCP's monitoring program without the on-site presence or supervision of the Conservation Program Manager. Prior to delegating any monitoring activities to a third party, Stanford will notify the Service, and will not delegate any monitoring activities to a third party without the applicable agency's approval.

Monitoring results will be included in the Annual Report.

4.6.1 California red-legged frog monitoring

California red-legged frogs have been surveyed annually at Stanford since the mid-1990s. Prior to the initiation of these annual surveys, specimens of California red-legged frogs were collected at Stanford, but the species was not the focus of specific field efforts. Night surveys have proved to be the most useful technique for monitoring the frogs at Stanford, but day surveys also have been found to yield information useful to conservation planning efforts. Recent records of red-legged frogs at Stanford indicate that the local frogs reproduce mainly in slow-flowing portions of Deer, Matadero, and San Francisquito creeks. Some reproduction also occurs in a small pool located in an old quarry near Matadero Creek. Surveys for egg masses in these creeks have not yielded consistent results. The following monitoring program is based, in part, on Stanford's experience with various monitoring techniques, prior survey results, historical records, and the presence of potentially suitable California red-legged frog habitat.

Night surveys of areas recently occupied[9] by California red-legged frog

- Three times a year, occurring from late spring to early fall, Stanford will perform visual night surveys of portions of Matadero (including the "Quarry Pond") and Deer creeks

[9] For purposes of this HCP, "recently occupied" means that the species in question has been recorded from the particular location within the last 5 years.

that have recently been occupied by California red-legged frogs. The survey areas will bracket the recently occupied areas by at least 500 feet.

- The night surveys will assess the number of adult and juvenile California red-legged frogs, and larval frogs (tadpoles) and non-native species such as bullfrogs. The location, size, and sex of the frogs will be recorded. The presence of any egg masses also will be noted; however, it is anticipated that all California red-legged frog eggs will have hatched by the time these surveys performed.
- The surveys will be performed under the guidance of the Conservation Program Manager, and will typically include two persons walking through the creek and along the adjacent riparian zone with headlamps and/or flashlights.
- If there is inconclusive evidence that suggests an area is occupied (e.g., a ranid frog unidentified to species or hearing a "plop"), at least two follow-up surveys will be conducted.

Night surveys of potentially occupied areas

- Every 2 years Stanford will perform a night time visual survey along reaches of Matadero and Deer creeks that are not included in the annual night time survey. Any of the small unnamed, seasonal tributaries which are deemed potential red-legged frog habitat will also be surveyed every 2 years.
- The night surveys will assess the number of adult and juvenile California red-legged frogs and larval frogs (tadpoles). The presence of any egg masses also will be noted; however, it is anticipated that all red-legged frog eggs will have hatched by the time these surveys are performed.
- The surveys will be performed under the guidance of the Conservation Program Manager, and will typically include two persons walking through the creeks and tributaries and along the adjacent riparian corridors with flashlights and/or headlamps.
- If red-legged frogs are observed during these surveys, the sites will be considered occupied areas will be added to the areas surveyed annually.
- If there is inconclusive evidence that suggests an area is occupied (e.g., a ranid frog unidentified to species or hearing a "plop"), at least two follow-up surveys will be conducted.

Day surveys of suitable habitat

- At least once a year, occurring during late spring to early fall, Stanford will visually survey all reaches of Deer and Matadero (upstream from Foothill Boulevard, including the "Quarry Pond") creeks passing through Stanford lands, and the adjacent riparian zone to assess the overall condition of the waterways and adjacent riparian zone.
- While not the primary focus of this effort, these day surveys will assess the number of adult and juvenile California red-legged frogs, and larval frogs (tadpoles) and non-native species such as bullfrogs and centrarchid fishes. The presence of any egg masses also will be noted, however, it is anticipated that all California red-legged frog eggs will have hatched by the time these surveys are performed.

- The surveys will be performed under the guidance of the Conservation Program Manager and will include snorkel surveys and walking through the creeks and adjacent riparian zones.
- If red-legged frogs are observed during these surveys, these locations will be considered occupied and will be added to the areas surveyed annually (see night surveys of areas recently occupied, above).
- If there is inconclusive evidence that suggests an area is occupied (e.g., a ranid frog unidentified to species or hearing a "plop"), at least two follow-up surveys will be conducted.

Habitat monitoring

- The physical condition of the waterways and surrounding vegetation will be assessed during annual field visits, noting significant tree loss or falls, declines that may be attributable to disease, and presence of non-native plant species.
- Ten riparian transects will be established in appropriate areas to determine habitat quality for frogs and will be surveyed every 5 years.
- Baseline conditions will be determined within 2 years of the issuance of an incidental take permit by the Service.

Day surveys of other areas

- Every 3 years Stanford will visually survey portions of creeks found on its lands which have not been included in the annual surveys. These reaches include Matadero Creek downstream of Foothill Boulevard, and any of the unnamed seasonal tributaries which are considered potentially suitable California red-legged frog habitat.
- These surveys will be conducted between late spring and early fall.
- The surveys will be performed under the guidance of the Conservation Program Manager and will include snorkel surveys and walking in shallow areas of the creek/tributaries and along the adjacent riparian corridors.
- If California red-legged frogs are found during these surveys, these areas will be added to locations addressed by the annual night surveys (see protocol for "night surveys of areas recently occupied").
- If there is inconclusive evidence that suggests an area is occupied (e.g., a ranid frog unidentified to species or hearing a "plop"), at least two follow-up surveys will be conducted.
- The physical condition of the waterways and surrounding vegetation will also be assessed during these field visits.

Day surveys of created off-channel ponds

- Stanford will survey the constructed ponds and the surrounding upland areas every 3 weeks beginning in January and continuing through July in order to locate egg masses and track their progression as tadpoles and metamorphs.
- Pond surveys will include dip netting, visual observations, and use of metering equipment.

- Surveys will include four transects every 3 years to determine open water, emergent vegetation, shoreline vegetation, and upland vegetation.
- Basic water quality parameters will be measured during each interval (e.g., water level, conductivity, clarity).

4.6.2 California tiger salamander monitoring

California tiger salamanders have been studied at Stanford and in the vicinity of Stanford for more than 100 years, with major research by Professor Twitty in the 1930s and 1940s. Since the early 1990s, the local tiger salamanders have been monitored annually and many techniques have been tried. At Stanford, the most productive monitoring methods are night surveys during the late fall/early winter migration season, and larval surveys during spring (using either minnow traps or dip nets). Occasionally, visual surveys for eggs were successful, depending on water clarity. Egg frames, drift fences, pitfall traps, cover boards, and a number of other techniques have also been tried during these annual efforts, but the value of the results were low, and did not warrant the effort. The following monitoring program is based, in part, on Stanford's experience with various monitoring techniques, prior survey results, historical records, and the presence of suitable breeding habitat.

Rainy season night surveys of salamander dispersal routes

- Stanford will visually survey each of the following areas five times per year, between October and February: (1) Junipero Serra Boulevard, from Campus Drive West to 300 feet south of the Gerona Gate to the foothills; (2) along Campus Drive West, from Junipero Serra Boulevard to Santa Teresa Street; (3) along Campus Drive East, from Junipero Serra Boulevard to the entrance of the Sigma Alpha Epsilon fraternity parking lot; (4) along the foothills service road, from Junipero Serra Boulevard to Reservoir 2 (enclosed water reservoir), and from Junipero Serra Boulevard to the drainage adjacent to the faculty housing, and (5) the pathway circling Lagunita.
- The surveys will assess the distribution and abundance of migrating tiger salamanders, and the locations and approximate numbers of vehicle-caused mortality.

Rainy season night surveys of areas only rarely traversed by salamanders

- Stanford will visually survey each of the following areas at least three times per year, between October and February: (1) Links Road; (2) Governor's Avenue from Campus Drive West to Santa Teresa Street; (3) Electioneer Road, and (4) Lomita Drive, from Santa Teresa Street to its end just past the Knoll, including Lomita Court.
- The surveys will assess the distribution and abundance of migrating tiger salamanders, and the locations and approximate rate of vehicle-caused mortality.
- If five or more salamanders are observed in any of these areas during a given year, that area will be added to the list of more frequently surveyed sites.

Egg mass surveys

- Stanford will visually survey the shallow portions of Lagunita and the constructed ponds in the foothills for tiger salamander egg masses. Visual surveys for egg masses will be done three times between late December and mid-February.

Larval surveys

- The purpose of the larval surveys is to determine whether breeding has been successful and whether the larvae persist and eventually metamorphose. The larval surveys will be used to verify whether successful reproduction has occurred (i.e., whether a larva has transformed into the terrestrial stage). For the purposes of this HCP, once a larva has begun to exhibit the morphological features indicating metamorphosis to the terrestrial stage, it will be assumed that successful reproduction has occurred as long as the pond retains water an additional 2 weeks.
- Stanford will place sets (groups) of minnow traps (1/8 inch mesh), as described below, in Lagunita and the constructed ponds in the foothills every 3 to 4 weeks starting in late February/early March and ending when water temperature/quality becomes suboptimal. A set of traps will consist of 15 collapsible minnow traps. This should produce three to five rounds of trapping per year.
- Traps will be deployed in the late afternoon and retrieved by mid-morning the next day.
- In Lagunita, nine sets will be deployed each round of sampling, with eight sets placed in the shallows around the perimeter of the reservoir, and one set placed at the center of reservoir location. This will result in 135 total trap nights per round of sampling.
- In the foothill ponds, single sets of traps will be deployed in each pond per sampling round. The traps will be placed such that they are located across the depth range of the individual ponds (with the shallowest sited traps being just barely completely submerged).
- If trapping is halted due to temperature increases, monitoring by way of dip netting will occur until the ponds are dry.

General wetland and upland surveys

- Stanford will survey Lagunita, the constructed ponds in the foothills, and the surrounding upland areas every 3 weeks beginning in January and continuing until the ponds and Lagunita dry.
- During each survey, Stanford will determine the: density of mid-water invertebrates; distribution and abundance of amphibians, predominantly eggs masses and larvae; and basic water quality parameters, including water level, conductivity, and clarity.
- Ponds will be surveyed to ensure that there is sufficient cover and substrate suitable for egg mass attachment.
- Surveys of the upland areas will include walking through the grasslands and noting the condition and type of surrounding vegetation (e.g., species composition, rough percent cover, etc.), presence of ground squirrels, and extent of areas of disturbance. The distribution and condition of cover-providing features, such as the constructed cover

piles, will also be recorded. Surveys will include four transects every 3 years to determine open water, emergent vegetation, shoreline vegetation, and upland vegetation.

4.6.3 San Francisco garter snake[10] monitoring

Surveys for garter snakes at Stanford and in the vicinity of Stanford have been performed sporadically since Stanford University was founded. Surveys conducted since the 1970s have focused on Lagunita, San Francisquito Creek, and near the SLAC National Accelerator Laboratory. The results of these surveys and other historical information are described in Section 2.4.3. Generally, small numbers of garter snakes are found annually at Lagunita, but are very infrequently encountered elsewhere on Stanford lands. Historical data indicate that garter snakes may have occupied other areas at Stanford. More recent riparian surveys, in areas that provide suitable garter snake habitat, focused on steelhead, California red-legged frogs, and western pond turtles, and did not look for garter snakes. The following monitoring program is based, in part, on prior surveys, historical records, and the presence of potentially suitable garter snake habitat.

Baseline distribution surveys

- Within 1 year of the Service issuing an Incidental Take Permit, Stanford will prepare a draft baseline distribution survey plan to establish the distribution of garter snakes.
- The draft plan will identify locations for visual surveys and trapping, and will include, but not be limited to, the following areas:
    - Matadero/Deer creek riparian zone
    - Lower foothills (constructed CTS ponds and natural wetlands)
    - Lagunita
- The Service will have 60 days to comment on the draft baseline distribution survey plan, and if Stanford does not concur with the Service's recommendations, Stanford and the Service will confer to develop a mutually agreeable solution and provide a final baseline distribution survey plan within 45 days.
- Stanford will implement the plan.

Final Monitoring Plan

- Following the completion of the baseline distribution survey plan, Stanford will submit a draft monitoring plan to the Service.
- The Service will have 60 days to comment on the draft monitoring plan, and if Stanford does not concur with the Service's recommendations, Stanford and the Service will confer to develop a mutually agreeable solution and provide a final monitoring plan within 45 days.
- Stanford will implement the monitoring plan.

[10] While the San Francisco garter snake is the Covered Species, monitoring will consider all garter snakes in order to gather data on the species and its subspecies.

Table 4-1 Anticipated Loss of Habitat from Future Development

	Zone 1 (acres)	Zone 2 (acres)	Zone 3 (acres)	Total (acres)
Development under GUP	15	15	0	30
Development beyond GUP	5-13	10-25	35-62	50-100
Total Development	20-28	25-40	35-62	80-130
Total acres in Habitat Zone	623	517	688	1,828
Percent Developed	3.2-4.5 percent	4.8-7.7 percent	5.1-9.0 percent	4.4-7.1 percent

See separate attachment for Table 4-2 Preservation or Enhancement Activities.

See separate attachment for Table 4-2 Preservation or Enhancement Activities.

Table 4-3 Mitigation Ratios for each Habitat Management Zone

Management Zone	**Credits Required Per Acre Of Converted Habitat**
Zone 1	3
Zone 2	2
Zone 3	0.5
Zone 4	0